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approach

MARCH 1975 THE NAVAL AVIATION SAFETY REVIEW

FORMATION FLIGHT

By CAPT George L. Brewer, USMC
VT-3

REMEMBER as a kid when you saw a formation of military aircraft in a movie or airshow and you thought how great it looked and what a thrill it would be to be part of such a team? There's no greater pleasure for most aviators than to demonstrate or reminisce about formation flying, that essential part of every pilot's aviation training.

Formation flying is more than just two or more aircraft flying close together, and its basic principles should be understood by all. Not only does formation flying increase a pilot's proficiency in the aircraft, it develops the confidence in airborne leadership necessary to accomplish aviation missions.

The basic concept of relative motion, so essential to a pilot's judgment and motor skill ability, is introduced during formation training. When maneuvering in close proximity to other aircraft, the pilot grasps the total concept and interrelationships of power coordinated with control surfaces.

Formation flying is where the aviator pools all prior experience and knowledge into one package. The expertise of piloting combined with his ability to visually perceive and utilize his motor skill in an integral team effort is perhaps the most valuable lesson learned in formation flying.

Although NATOPS specifies an optimum position for those aircraft designed for formation flight, most activities have standardized operating procedures for those instances such as flight demonstrations or tactical movements where formation flying is required.

The fighter and attack communities consider a formation a highly effective tactical unit that can be employed for both mutual offense and defense. The lessons of WW II, Korea, and Vietnam have vividly shown us that the mutual support between aircraft is essential

to our continued success in aerial combat and close air support.

Flight Leadership. Flight leadership is perhaps the most important element in accomplishing a mission in the safest, most professional manner. No matter how good a stickman the pilot is, the responsibility that rests with the leader of the flight is tremendous and cannot be taken lightly.

OPNAVINST 3710.7G, in effect, states that the pilot in command has the responsibility for safety of the flight. This responsibility, which shall not be transferred in flight (except in rare circumstances), includes preflight planning and briefing of all members of the flight. The pilot in command is responsible for every action of the flight and must have the skill, maturity, and knowledge essential to complete the mission successfully. The safety of all personnel is dependent on the flight leader's experience.

Much has been written concerning the training of the newly designated "nugget," but just as important is the refresher training and proficiency of the second-tour and senior first-tour pilot. These men have the needed experience to effectively train the newly designated pilots.

Physiological Factors. Anyone who has flown formation has a concept of the physiological factors involved, but a basic review is needed because of their impact on members of a flight.

Stress and fatigue, or a combination thereof, are often primary considerations in accident investigations. Fatigue slows the muscular action of the eyes resulting in a breakdown in scan and decreased alertness. Scan must be shifted frequently, or fixation will result, causing loss of position and reduced sighting distances. The wingman must occasionally focus on estimable distances to avoid fixation and relieve fatigue.

Glare and sunlight are critical in positioning the wingman. Excessive glare or sunlight can overstimulate the eye resulting in the loss of sensitivity. Contrast stimulates the eye, aiding the wingman in overcoming fatigue and recognizing relative motion. Dull skies allow for total aircraft contrast, but when the color scheme blends with the background, fatigue and scan breakdown may occur resulting in a reduced concept of relative motion and a loss of position.

Vertigo, a real killer, is ever present when the flight is in clouds or IMC. When it occurs, the wingman must immediately recognize it and completely rely on the leader's aircraft in the same manner he relies on his attitude gyro.

Turbulence can cause fatigue, stress, and a deterioration of vision.

Hypoxia results in the loss of visual acuity, constriction of visual fields, and difficulty in focusing.

The above physiological factors are mandatory considerations on the part of the flight leader and

wingman, and only by accepting these human limitations and understanding them can we conduct our flight in the safest manner.

Inflight Coordination. Anyone who has flown with a leader who didn't utilize head or hand signals understands well the hazards involved. The leader must be aware of and consider the limitations of his wingman. He must never lead him into a situation which exceeds his capabilities. Every move the leader makes must be predicated upon the effect it will have on his wingman. Adequate advance warning must be given whenever possible for any maneuver or changes in power, procedures, or plans. The flight leader must aid his wingman as much as he can in all respects.

During the brief, lead must ensure all members of the flight understand all the inflight signals that may be used. When radio silence is mandatory or an emergency occurs, visual signals are invaluable. Be sure they are clearly visible and can be completely understood.

Cardinal Rules. There are three cardinal rules for all formation flight: 1) never take your eyes off the leader, 2) always maintain stepdown, and 3) never pass ahead of the leader. Stepdown is mandatory and must be maintained, with the exception of certain low level portions of flight.

The Rendezvous. *General.* The rendezvous is used to join two or more aircraft into a formation. It offers maximum fuel economy and saves precious time since the leader can depart directly on course.

Normally, the wingman may be briefed to use one of two types of joinup depending on circumstances: the running rendezvous, where a speed differential is utilized, or the carrier type, turning inside the leader's radius of turn.

A safe rendezvous begins in the brief when a joinup speed is selected. This is essential and is most often governed by squadron SOP. A high closure rate, not readily apparent at a distance, can result in an unsafe condition. Therefore, a wingman should always request an airspeed check if he's unsure of the leader's speed.

The Running Rendezvous. Scan is the most significant factor in recognizing relative motion. Therefore, the wingman must begin his scan long before he approaches the leader's aircraft.

Further, it is imperative that the wingman initially obtain some lateral separation. This places a larger surface area of the lead aircraft in the wingman's vision, thus aiding him in the recognition of relative motion and closure rate.

Smooth, coordinated adjustments in power enable the wingman to control closure rate. When approaching the leader, the wingman will pick up his lateral separation checkpoint and, by keeping a little sky between lead and horizon, while maintaining stepdown, move into parade position using the specific bearing checkpoints as reference.

During the running rendezvous, if an excessive closure rate occurs and the wingman cannot safely execute the joinup, he will execute an underrun. Do this by maintaining stepdown, reducing power, and obtaining additional lateral separation. When relative motion is under control, join in the parade position. Remember, the three cardinal rules are mandatory when executing the underrun.

Carrier Rendezvous. With the leader in a turn, the wingman uses the radius of turn to aid in the joinup.

This is done by positioning the leader to the right or left of the nose on a constant bearing and using power as necessary to control the closure rate. Theoretically, if both the leader and the wingman are coaltitude and at the same airspeed, by maintaining a constant bearing, only radius of turn is needed to join up. In a climb or descent, or if lead is faster or slower, power adjustments will be necessary.

When approaching the leader, the wingman will slowly step down to arrive on or slightly inside the leader's radius of turn and use power as necessary to move to the parade position. Again, if an excessive closure rate occurs and the wingman cannot join up safely, he will execute an underrun.

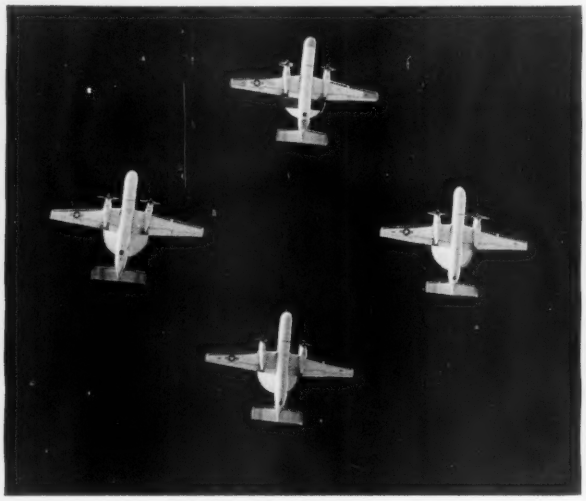
To do this, obtain stepdown, level the wings, and reduce power as necessary to avoid passing ahead of the leader. Never lose sight or pass ahead of the leader, and always maintain stepdown. When outside the leader's radius of turn, and airspeed is under control, rejoin in the parade position.

Basic Parade. The parade position is maintained by the coordinated use of all controls. Throttle controls nose-to-tail distance. Elevators control step-up and

stepdown. Ailerons control heading changes and lateral wingtip clearance.

Although trim is the single most important factor in maintaining a smooth wing position, early detection of relative motion and smooth, deliberate corrections are also very important.

The wingman normally uses checkpoints to maintain proper position. Checkpoints usually provide safe wingtip clearance, stepdown, and nose-to-tail distance. They are usually established by NATOPS or squadron SOP and should be strictly adhered to except during unusual circumstances.



Parade scan is usually circular about the leader's aircraft. This allows the wingman to see any head or hand signal as he is fine-tuning his position using checkpoints.

The Crossunder. The crossunder is the movement of the wingman from one side of the formation to the other. The primary consideration on the part of the leader is to provide a stable platform for the wingman to maneuver about. The wingman must maneuver slowly and safely into position.

Two methods can be used: the box method (introductory) or the arcing method (standard crossunder). Remember, the crossunder is started from a good parade position.

The Box Crossunder. To execute, take proper stepdown, adjust power, and stabilize for an instant. Then make a slight heading change toward the leader and level the wings. Use power as necessary to control nose-to-tail distance. Recheck wings level directly behind the leader, anticipate the leader's wingtip vortices, and apply stick pressure as necessary in the direction of motion to continue movement to the opposite side. Maintain stepdown throughout the crossunder, and obtain lateral separation prior to applying backstick and moving up into the parade position. A little power may be necessary to move up into position.

The Arcing Crossunder. To execute, make a slight heading change toward the leader and level the wings. As lateral movement is commenced, apply forward pressure on the stick to move in an arc and pass directly behind the leader with proper stepdown. Apply power as necessary to maintain proper nose-to-tail distance. At a point directly behind the leader, anticipate the wingtip vortices and apply stick pressure as necessary in the direction of movement to arc laterally up and into the parade position.

Remember, safety is paramount. So, move slowly and safely in relation to the leader's aircraft.

Turns. Before commencing the turn, lead must signal the wingman. The leader must smoothly roll in and out at a constant rate of roll. The larger the formation, the slower the rate of roll. The wingman's power changes will depend on the leader's rate of roll. Anticipation is a key factor here.

When the leader rolls away, the wingman will rotate about his own longitudinal axis and anticipate the use of power since he will be moving outside the leader's radius of turn. He must keep the same amount of sky under the leader's nose to maintain stepdown and keep the bearing checkpoints in the same vertical plane. Anticipating the rollout, he reduces power as the leader rolls wings level and smoothly coordinates all controls to arrive at the parade position.

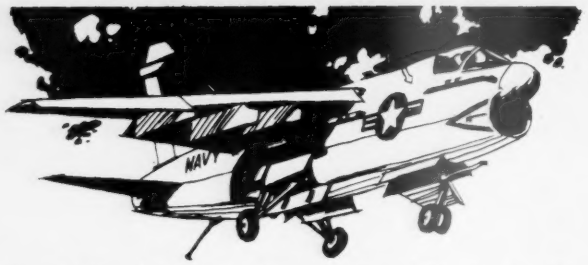
Being turned into, the wingman will rotate about the leader's longitudinal axis and anticipate a slight reduction of power. Apply forward pressure as necessary to maintain the same view of the bearing checkpoints as in level flight. Anticipating the rollout, the wingman will add power and backstick as necessary to maintain the same view of the bearing checkpoints on the rollout.

Lead Change. The lead change is the movement of the leader to a position subordinate to a new lead. Prior to passing the lead, the leader must clear the area and ensure that the wingman is ready to accept. Once the lead is transferred, it is of extreme importance that the old leader not take his eyes off the new leader.

After the lead has been passed and accepted, the old leader will slowly obtain lateral separation. He will reduce power slightly and slide back slowly toward his new position.

Formation flying is a highly essential part of our training and one of the most demanding skills in professional aviation. Hopefully, this article has accomplished its mission of reviewing basic fundamentals and illustrating the interrelationship of flight leadership, physiology, and communications as they apply to formation flying. ◄

AIR BREAKS



Show Your Lights. A P-3 took off for night bounce and departed the pattern for some preliminary air work. A while later the PPC headed back toward the field and contacted the tower, 20 west. He requested a GCA to a touch-and-go.

The tower advised there were jets in the FCLP pattern and denied the P-3's request to bounce. The PPC acknowledged and asked for multiple GCAs. While working with GCA, the PPC was told the jets were landing to refuel and the bounce pattern was open.

The PPC elected to complete the PAR he was on and requested to remain in the pattern to shoot his landings. He was cleared. During climbout after the fourth touch-and-go the tower advised that FCLPs were beginning again. The P-3 copilot asked, and was cleared, for a full stop landing. At the 180 he told the PPC he had a light reflection dead ahead. They were closing another aircraft which didn't seem to be lighted.

The PPC broke left, added power, and climbed out. The tower was advised but didn't appear to understand the near-miss and took no action to get the pattern back to normal. Business as usual. The PPC entered a wide downwind and requested the traffic.

He was cleared to land. While on a long final, about 750 feet AGL, both pilots saw another aircraft closing rapidly from their starboard. Again the P-3 waved off, told the tower, and was cleared to reenter downwind. The next pass was uninterrupted and the P-3 made a final landing.

Later, in putting the pieces of the puzzle together, the inquisitive PPC determined that the aircraft reflecting their landing lights was an A-5. It had been cleared by the tower to enter *inside* the P-3 pattern but the P-3 wasn't advised by the tower that the A-5 was ahead of him. The A-5 had his wing lights on but no anticollision beacon.

The other aircraft which had closed the P-3 was an F-4 which had been cleared *behind* the P-3. The F-4 did not acknowledge his sequence nor did the tower advise the P-3 of the F-4's location. These events were verified by tower tapes.

The incident was discussed by all concerned – pilots, the ASO, and the ATC folks – and corrective action has been instituted to preclude this from happening again at that field.

Wouldn't it be nice if some of our large wind machines were equipped with strobe anticollision lights? Might have helped the "reluctant" tower operators charged with running the game and kept the pilot pucker factor down a tad. – Ed.

Lightning Strike. It was a miserable day. The temperature was in the mid-fifties and winds were 15, gusting to 25. There were low clouds scudding rapidly across the air station and thick, dark, cumulus clouds were in all quadrants. It was raining, sometimes hard, and lightning and thunder were seen and heard frequently.

Throughout all this, the crew of a transport was busy unloading the aircraft after a long flight. The forward baggage compartment was open, and several people were offloading baggage.

Witnesses saw a bolt of lightning strike the tail and exit through the left wingtip. As the strike occurred, the loadmaster touched the aircraft while standing on the ground. Zap! He received an instant shock. The loadmaster wasn't injured, but he had a numb arm for an hour.

Obviously, flight and linecrews should attach ground wires to aircraft being serviced under the above conditions or knock off all servicing until there is no chance of

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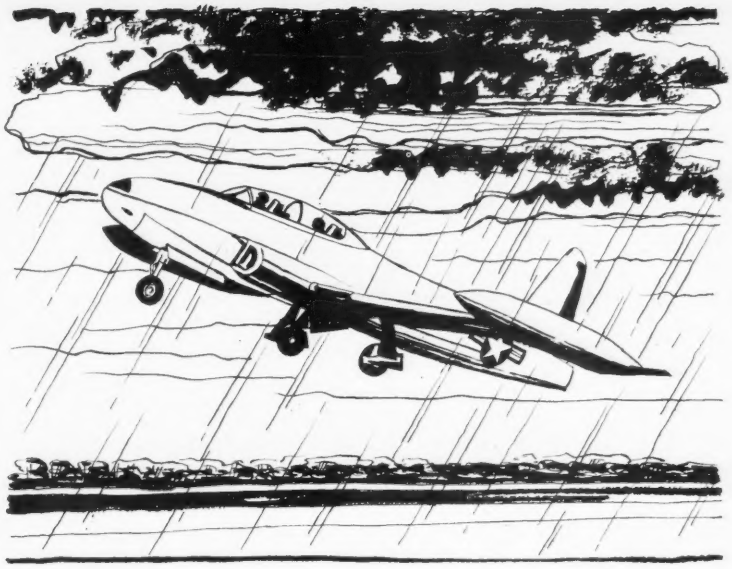
lightning.

(And pilots still wonder why fuel pits are closed when ''bumpers'' are in the vicinity. – Ed.)

Down the Drain. Lieutenant Robert B. Kidd was the PPC of a P-3. After completing an ASW training flight, he taxied the *Orion* through the deluge washrack and headed for his line. He had taxied about 225 feet from the washrack when the aircraft came to a sudden stop with the left wing down a few degrees.

Many pilots would have gunned it, but he didn't. He called for the secure checklist and completed it. After the crew had left the P-3, they found that a portion of the concrete ramp had given way beneath the port mainmount. The left gear was in a hole about 20 inches deep.

Apparently, the storm drain, under that portion of the ramp, had eroded the soil. The weight of the *Orion* caused the concrete to break and become an instant hole. The aircraft was raised by air bags, and the hole covered with boiler plate. The CO lauded all hands for recovering the P-3 without damage.

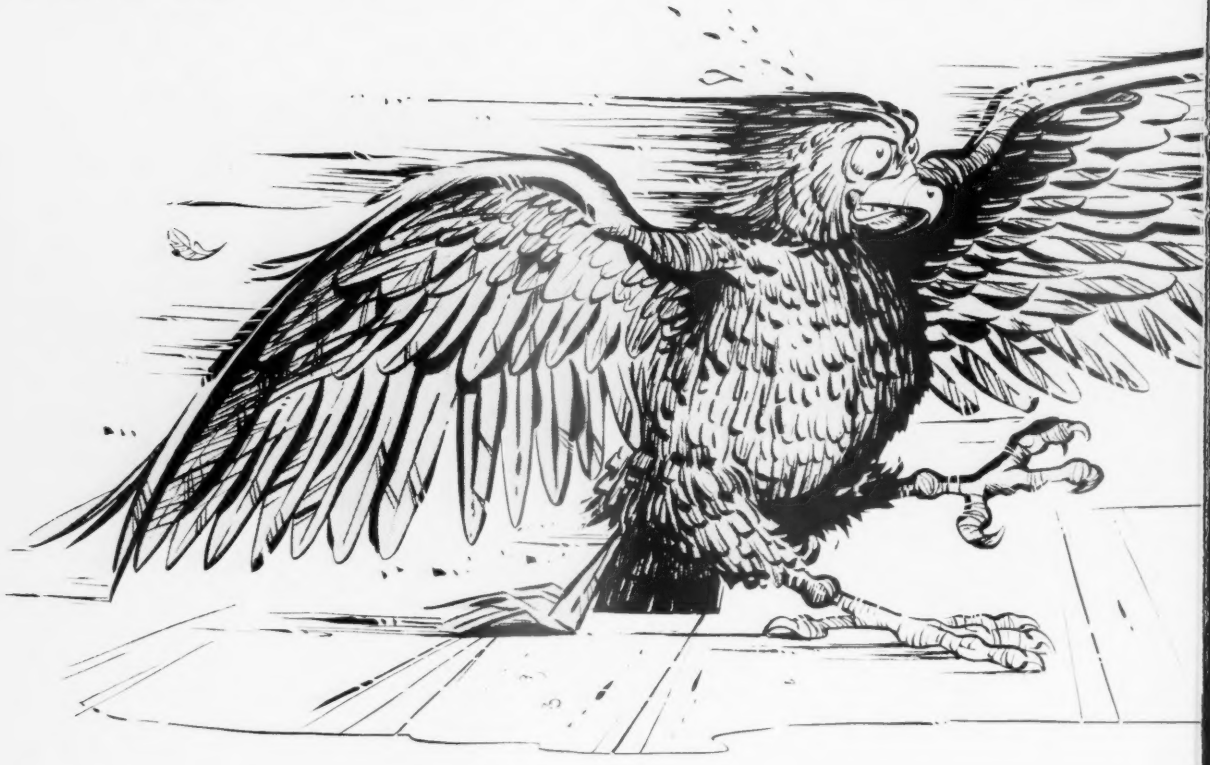


Pitot Troubles. A T-33B departed NAS South on the final leg of a cross-country flight to NAF headquarters. Weather during takeoff and climbout was IFR in light rain. Passing 15,000 feet, the VSI and altimeter in both cockpits began erratic fluctuations and gave erroneous indications. The pilots didn't recall exactly when the pitot heat was turned on, but believed it was prior to takeoff.

No visible icing was noted by either pilot during climbout, although the freezing level was forecast to be 13,000 feet. The aircraft was leveled at what was indicated to be FL310, followed by airspeed bleedoff to zero over a period of about 10 minutes. The VSI then indicated a 100 fpm rate of descent continually with a corresponding altitude decrease. The aircraft was in level flight.

VFR conditions were encountered for the remainder of the flight, and another T-33 intercepted the aircraft for escort to Homebase. With FL310 indicated on the intercepting aircraft's altimeter, the lame aircraft indicated FL270. During descent, airspeed was 250 KIAS, but indicated as high as Mach 1.4. Below 3000 feet, all systems returned to normal, and an uneventful landing was made.

It is suspected that the pitot tube heater was not turned on soon enough. Maintenance personnel troubleshot the airspeed/altitude system with an air data tester TTU 205 with no defect noted. A subsequent test flight could not duplicate the discrepancy. ◄



Skyhawks and Wet Runways

By LCDR C. N. Sapp, Jr.
VA-45

The Scene:

Any old A-4 squadron readyroom (not as hard to find as one would think). The weather in the local area is frightful, the wind gusting to prohibitive. The local chapter of Hangar Flyers Anonymous has gathered to spread bilge in the minds of the attentive and admiring fledgling tigers.

Ops boss has just finished the 123rd unabridged version of his single-handed defeat of an entire fighter squadron while flying an A-4C with a full buddy store. Not to be topped by such wall-worn graffiti, LT Red Hott, the local pylon turn expert, begins relating an experience that happened to a *friend* of his in another squadron who attempted to land his A-4 machine at night on a wet runway with a quartering tailwind. With appropriate expletives and arm flails, he describes the resultant loss of control, 180-degree turn, and runway departure experienced by his hapless and heretofore unidentified "friend." The convivial spirit of the occasion is suddenly deflated by a voice from the back of the room. ENS Sharp, fresh from the Training Command, asks why LT Hott's friend failed to make a shortfield arrestment.

The room goes silent. LT Hott slowly lowers his poised coffee cup to the table. LCDR Fixitlater, maintenance officer and combat veteran of many wars (the boys call him "Patches"), sucks in his breath. All eyes turn and glare penetratingly at the FNG. Electric tension pervades every corner of the readyroom; pulses race and blood pressures rise.

Ops boss takes on the appearance of Charlton Heston as Moses, chastising the Israelites. His hair greys, his nostrils flare, storm clouds gather. Sharp suddenly knows that he has committed a *faux pas.* Ops thunders:

"Purge thy mind of such evil and unprofessional drivel, lad! Had thy hook been meant for use ashore, it would have been welded in the down position, and all Navy runways would be 1000 feet in length and built on giant lazy susans, so that they might always be turned into the wind. Drogue chutes are for fighter pilots, reverse thrust for VP-ers, antiskid for *Corsairs,* and tailhooks for turkeys like you. Son, the "Skyhawkers" can handle it, and don't you forget it!"

In the midst of all the verbal abuse, Sharp knows better. A recent study of A-4/A-7 wet runway accidents (July '72 through September '73) revealed 10 accidents during the landing phase, six of which belong to "Skyhawkers." Despite the advent of spoilers and drogue chutes, not to mention the accumulation of 20 years of operational experience, the A-4s still continue to leave the runway at other than designated turnoff points. An alternative to this disgraceful, unprofessional, and downright hazardous waste of assets is action well short of reinventing the wheel. All that is necessary is the reemphasis of some old common sense rules and the revamping and modernization of some not so common sense attitudes that still persist.

The hazards associated with wet runway landings are well known. The intent of this article is not to parrot that section of NATOPS but rather to shake the cobwebs from the minds of those who are most often where the action is in aviation safety . . . the pilots.

Preflight weather briefings, enroute updates with metros and flight service stations, terminal weather provided by approach control, and plain old "looking out the window" should provide plenty of opportunity for the pilot to avoid surprises upon encountering a wet runway. Even if the rain has stopped and all else fails, initial touchdown should give an indication of the surface conditions, and a waveoff can be initiated if necessary. *Remember:* arresting gear is expensive to install, cheap to operate. Planes are expensive to buy *and* expensive to replace. So, when in doubt, let it hang out . . . the hook, that is!

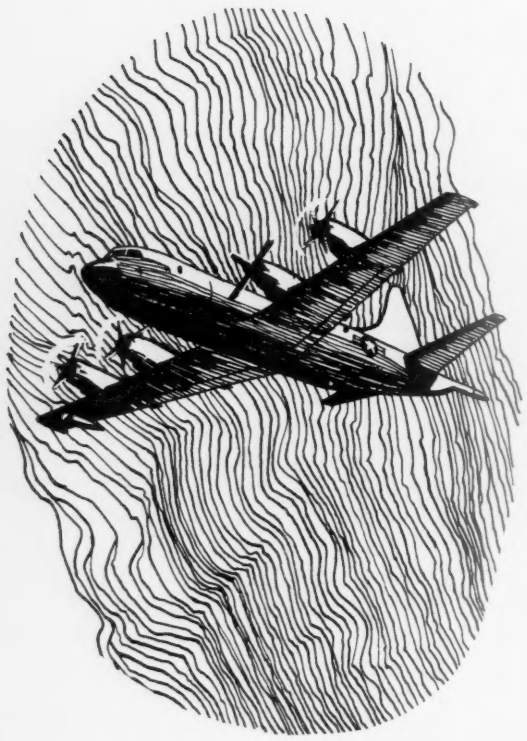
The rationale of making a normal landing with the intent of catching the midfield gear should things go wrong is also less than sound. Of the accidents reviewed, eight made no attempt at arrestment, left the runway *prior* to the midfield gear, or the aircraft was in some attitude (sliding backwards, etc.) which precluded proper engagement. So, the landing phase is where men are separated from the boys; and the boys, all too often, are separated prematurely from their aircraft. Once the decision has been made to arrest, do it by the book – on speed, landing checklist complete, centered ball, on centerline. Touch down on the money and leave approach power set until engagement is confirmed. Bolter? Don't take it lightly. Two of the accidents in the study occurred as a result of the pilots electing to remain on deck after a hook skip. So, execute a go-around, fuel and weather permitting.

The planned shortfield arrestment is a panacea for many ills; gusty winds, water on the runway, low visibility, brake problems, tailwind, drogue chute failure, spoiler failure, and blown tire(s), to mention only a few. The aircraft damaged over the 14-month period represent two shy of a full blown attack squadron – a significant blow to anyone's budget.

The shortfield arrestment is such an obvious and effective answer to this problem that, since September 1971, it has been mandatory as a result of the COMLATWING ONE/NAS Cecil Field Wet Runway Recovery Bill which has been expanded to include A-4s as well as A-7s. And needless to say, the spirit of the instruction also applies while landing at fields away from home. COMFITWING ONE at NAS Oceana is presently considering doing the same thing for the fighter community as a result of the recently published Safety Analysis of Instrument Related Accidents.

The A-4 is still the same honest, simple, and reliable aircraft that it always has been, but it also slides, spins, and blows over on its back when abused. If we expect to truly have *"Skyhawks* Forever," more thought should be given to their care and feeding. Don't fall into a trap . . . take one instead! ◄

You Just Can't Buy Experience Like That



By Author Unknown in VP-8

WE WERE scheduled for a weekend cross-country to Dobbins AFB and NAS Memphis. The weather in Brunswick was typical for the middle of December – cold and clear. A light, freezing rain had fallen the night before, leaving the taxiways and runway covered with a thin, smooth layer of ice. Little did we know that this was the beginning of a never-to-be-forgotten weekend.

Our problems didn't really start until the following night enroute from Dobbins to Memphis. We had just leveled off at FL220 and were setting cruise power when we heard a muffled explosion on the port side of the aircraft. The plane swerved left slightly. Number 2 engine firewarning lights glared and the horn blared. Seconds later, the oil pressure caution light for No. 2 came on. The firewarning indications ceased seconds later.

The E-handle was pulled and the HRD button pushed, but the prop failed to feather completely. The light was on, but the prop continued windmilling at about 10 percent RPM. The prop feather circuit breaker popped and would not reset. A few minutes later, the prop stopped rotating.

We asked for a weather forecast for Memphis. They were calling for freezing rain with slush already on the runway and expected the field to close. We had just taken off from Dobbins, and the weather there was good. The forecast for return to Dobbins at our ETA was favorable.

We commenced our approach, optimistic that we would get in on the first try. And why shouldn't we? The weather was predicted to be good, and besides, we already had our emergency for the day. Nothing else could go wrong, right? Wrong!

Descending through 1000 feet, we were still in the clouds, completely IFR – this wasn't what was forecast. Leveling off at minimums, the field passed under our nose. We didn't even get a glimpse of the runway.

GCA advised that a fog bank had moved across the approach end of the runway just as we had started our approach. Tower advised that the approach end of the opposite runway appeared clearer, but GCA was not set up for that runway. We decided to try an ASR approach, and if we didn't get in, we'd go on to Jacksonville.

We were about to execute our missed approach when we saw the far end of the runway. Following a "circling" approach, the landing was uneventful, and we taxied to the transient line.

An inspection of the engine was made. Found were a large jagged hole in the side of the No. 2 engine cowling and several holes in the leading edge between the No. 1 and No. 2 engines. There was a dented leading edge on the horizontal stabilizer, a hole burned in one tire of the left mainmount, and other less serious damage. A turbine spacer had failed, throwing debris outward through the cowling.

All we could do was look at each other and remark – "You just can't buy experience like that."

There's only one reason for spending hours in the bounce pattern (shooting approaches and landings in different configurations), for spending hours studying the NATOPS manual, for spending hours in paper and practice emergencies, and for spending hours in the classroom and in flight checks. The reason is to make one so familiar with the aircraft's characteristics and so confident of his ability to handle it that in an emergency he can hack it. – Ed. ◄

It was 1530 EDT one Friday afternoon when the big aircraft crashed and burned, right in the middle of a residential area. More than 30 (crew and civilians) were killed, and many more were missing. About 2 weeks later, the mishap board concluded cause unknown and surmised pilot disorientation.

Quiet, Pros at Work

THE ACCIDENT in the prologue is hypothetical, but in reality, see how close the following incident came to being a disaster.

The weather at takeoff was 200 foot overcast, 2 miles visibility in fog and drizzle. The P-3 grossed out at 120,000 pounds, and the crew was scheduled for an extended flight.

After liftoff and gear retraction, the pilot went on the gages, called for flaps up, and in accordance with departure instructions, began a right turn.

The copilot started flaps up on command, started reading the climb checklist, and at the same time established contact with Departure.

The pilot felt "uneasy" during the climbing turn. He sensed the *Orion* was unusually unresponsive. His scan shifted back and forth between the MM-4, VSI, and airspeed. The MM-4 indicated 7 degrees right bank. The copilot, who was keeping an eye on the gages, too (while doing other things), noticed a standard rate, right turn with 25 degrees right bank.

During the next few seconds, the copilot had to glance away; and when he looked again, he noted a 35-degree right bank. He looked over at the pilot and saw him begin to lessen the bank as the flight engineer hollered that the attitude gyros are indicating differently. The copilot told the pilot to level the wings using the needle ball, which was simultaneous with the very action the pilot was taking.

The pilot scanned the standby gyro and back to the normal AHRS several times, noting the same attitude information from both sources and no OFF flag. By comparison, it was determined the copilot's attitude gyro was correct. He was given control of the aircraft, and climbout was continued.

A decision to continue on to destination was made because of good weather enroute and at destination – besides, the aircraft was overweight for an immediate landing.

Inflight troubleshooting disclosed the pilot's MM-4 was binding in the roll axis at 7-10 degrees in both directions.

A review of NAVAIR 01-75PAA-1 revealed that the MM-4 OFF flag and its function was not explained. Most squadron pilots knew that a loss of reliable input signal or instrument power would cause the OFF flag to appear. They also believed that if the instrument itself failed, there would be an OFF flag. Not so. An urgent NATOPS change to clarify this point has been submitted.

When the cockpit crew lost their MM-4, it couldn't have been verified prior to takeoff. Its failure couldn't have occurred at a more critical time. It is essential, as proven by this crew, for all members of the cockpit team to back each other up. *(Various fixes are now being considered by NAVAIR. – Ed.)*

A Long Way, Baby

By LCDR Rodney N. Whalen

CONCERNING the new phrase, recently coined from an old adage, "everyone talks about aviation safety, but no one does anything about it" . . . there is absolutely no truth to such a statement. That the Navy's overall major aircraft accident rate for FY-74 dropped to an alltime low of 0.75 completely dispels the inference.

The overall major accident rate is derived by combining the number of major accidents per 10,000 flight hours of *all* Navy aircraft from *all* commands. And, through the years, some aircraft have contributed more towards lowering the overall rate than others.

By comparing the major accident rates of various aircraft for fiscal years '54, '64, and '74, it is readily apparent that an awful lot has been done in the field of aviation safety in a relatively short period of time.

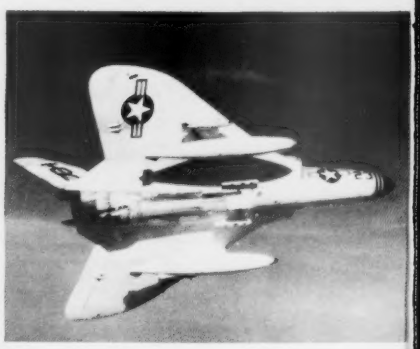
For example, how much did the F7U *Cutlass* of old contribute towards lowering the overall rate? Not too much, I'm afraid. In FY-54, the F7U's rate was a whopping 19.15! Thankfully, it was flown less than 3000 hours that year.

And how about the FJ *Fury?* Well, in FY-54, its rate was a booming 17.67! But, to be fair to the *Fury,* its rate had dropped to a respectable 2.74 by FY-64.

In FY-54, the F2H *Banshee* was flown nearly 142,000 hours. What was its rate that year? A 14.51 – no help here, either.

The F4D *Skyray* in FY-56 had a major accident rate of 34.78. It had just arrived in the Fleet. However, in FY-64, for 16,629 hours, the *Skyray* accident rate had been lowered to 0.61!

How about the early helos? Well, in FY-54, the H-19 "Horse" and H-25 "HUP" had rates of 8.21 and



6.48, respectively. But, by FY-64, their respective rates were down to 4.83 and 3.81. And that took *some* doing!

The heirs to their missions, the H-2 *Seasprite* and H-3 *Sea King,* had FY-74 accident rates of 0.40 and 0.64, respectively. The H-2's rate is down from 5.40 in FY-64, and the H-3's rate is down from 1.03 that same year – a tremendous effort.

Perennially, the T-34 *Mentor* has been a major contributor toward lowering the overall accident rate. In FY-64, the T-34 was flown over 103,828 hours with an accident rate of 0.29. In FY-74, a 0.26 rate was achieved for over 76,000 flight hours.

Kudos to the E-1 community, too. Their FY-64 rate of .76 was lowered to 0.00 in FY-74. Can't beat that.

You "attack" types can be proud of your declining records, too. From FY-64 to FY-74, the A-4 *Skyhawk* rate dropped from 2.48 to 1.04; the A-5 *Vigilante* dropped from 3.40 to 2.28; and the A-6 *Intruder* rate went from 1.32 down to 0.63.

Phantom drivers can also gloat. The F-4 rate dropped from 4.46 to 1.79. And the 1.79 rate was based on more than 150,000 flight hours. Just great!

Sometimes, it seems that we've really been busy breaking airplanes. Not so. We've been busy trying *not* to break them. And, we've been pretty successful. That's not to say we can sit back on our fat assets, because they aren't so fat.

Since individual aircraft accident rates are down (compared to the *Cutlass)* and the overall rate is down to 0.75, you may think "we've arrived" and tend to let up. Don't.

We *have* come a long way, baby, but we've still got a long way to go. Let's get there.

NEEDED: A Tangible Aeronautical Goal

I ADDRESS this article to the aviation personnel in command positions, not merely the commanding officers and such, but also the section leader, the aviation safety officer, and even (or perhaps, most especially) the coffee-drinking, Navy Times-reading ODOs. The subject concerns the tactical jet crewmember who has in his bag of experiences about 500 to 700 hours of flight time, several hundred hours in type, and just enough hairy situations to enable him to hold his own at Happy Hour.

The Crisis. Some of this reading may be very hard for a few of us to swallow. So, to put you in the proper frame of mind, I challenge you to a little quiz before proceeding.

(1) In the last 30 hours you have flown, how many of those hours have been truly productive? In other words, how many of those hours have you, as a crewmember, been challenged sufficiently as to label the hours legitimately educational?

(2) In your last five flights, for how many of them did you complete any appreciable amount of mission planning, other than the actual brief?

(3) In the last month, how many times have you sniveled off the schedule because of collateral duty priorities?

(4) Do you know the FXP-2 standard and qualifying scores for your aircraft's primary and backup ordnance delivery methods?

Let's take a moment to answer and analyze some of these questions.

(1) If your answer is less than about 25 hours, a problem exists. Unless your flying was in an instructor capacity, you are marking time in the air.

(2) If you failed to plan in detail five of your last five hops, a problem exists.

(3) If you have sniveled more than your share (and only your flight officer can judge), a very definite problem exists.

By CAPT Paul E. Hanover, USMC
VMA-224

(4) If you don't know what is expected of you in FXP-2, how can you know whether you're accomplishing the assigned mission?

The Cause. These questions are designed to illustrate the subtle but extremely dangerous tendency that frequently contributes to an accident: diminishing motivation. It is often identified (and I believe mistakenly so) as complacency. It is most severe in the experience group mentioned for three reasons: they have entered the realm of "routine training missions" for which only nominal planning is required and the performance is well within their capabilities; their collateral duties demand more of their time than their flying; finally, and most importantly, these junior aircrewmen are performance evaluated *primarily on their nonflying associated responsibilities.*

As a result of all this, we have created a Don Quixote, the tragic character who believed the significant to be trivia, who fits reality to his needs. Every squadron has its share of Dons. These are our friends who arrive brimming with the lust to soar which is slowly, subtly eroded by in-baskets and troop problems until a hop is little more than a pleasant interruption to a hectic day. Like Don Quixote, these people are riding for a fall. They are the folks with the out-of-date NATOPS and the people who snivel at the last minute because of workload. Unfortunately, they are also the people who are rusty on their emergency procedures and are less likely to be capable of coping with a difficult emergency.

The Cure. With the shortage of money and personnel which we are all experiencing, some form of positive action is needed to prevent the development of Don Quixotes in the squadron. The commanding officer can get the ball rolling by identifying his Dons and prodding them a bit to encourage that a few more hours be spent in the nav room or perusing a NATOPS manual. The executive officer can assist by patiently listening to the bleeding complaints of the Dons as they are led to the nav room or wherever, and the reporting seniors can help by remembering that a directly proportional relationship may exist between the size of his officer's in-basket and the amount of time his officer spends in preparation for and execution of an efficient mission.

The operations officer can be very helpful by seeing to it that the missions assigned are challenging. A local nav route, 30 minutes on target, and RTB for a few GCAs and touch-and-go's will challenge only the greener of the brood. Throw in some coordinated strikes, a few "really ready" times, a surprise FCLP period, or, assets permitting, an occasional minidet deployment. The aviation safety officer can help by making the Dons aware of their situation with a few five-question quizzes and a friendly or threatening word, as appropriate. The section leader and ODO can top off the reformation by being *exceptionally* professional in their briefs and preparation. If the ODO doesn't know the weather, the lineup, and other myriad details surrounding a launch, the hop is off to an unprofessional start.

In Conclusion. I mentioned way back that my subject was the *old* new guy. He is the aviator who suffers most from the Don Quixote syndrome. It's too easy to overlook the early stages of his disillusionment. If we stop and think, we'd realize that if he didn't wear wings, he wouldn't be with us. The Don Quixote type is generally a fairly intelligent and conscientious dude who, because he is conscientious, frequently snivels off a flight and who, because of his intelligence, rapidly tires of jousting at windmills when he does fly. In sum, he lacks a goal and the ensuing goal orientation/drive. And *you,* Mr. Command Position Man, are responsible. Give your Don Quixotes a tangible aeronautical goal and the time to pursue it. ◄

1 DEAD
7 INJURED
1 AIRCRAFT DESTROYED
7 INJURED
3 CARS WRECKED

VORTEX
TURBULENCE
FATIGUE

A LIGHT *Cessna* crashed at a Midwest airport after returning from a round trip charter flight. It was on final, following an *Electra,* when it crashed in an uncontrolled descent outside the airport boundary. The weather was excellent – 15,000-foot ceiling, 5 miles visibility, wind south at 5 mph.

The pilot was an instrument rated, commercial pilot with two passengers. He had contacted approach control at 1241, and after several transmissions, was instructed about 1248 "to continue approach . . . may line you up with 27R." At 1251, an *Electra* reported over the outer marker and received clearance for a visual approach and landing on 27R.

After the *Electra's* clearance, the *Cessna* pilot was asked if he had the *Electra* "off to your left and a little behind you, landing 27R." The *Cessna* pilot replied, "Wilco." Two minutes later the controller told the *Cessna* pilot he was cleared to land 27R, "request you make short approach, caution wake turbulence from the landing *Electra,* wind south at 5."

About 30 seconds later, the *Electra* landed and as he was given instructions to clear the duty at the next intersection, another aircraft advised, "light aircraft just crashed off the end of the runway, looks like he hit the jetwash."

The *Cessna* crashed onto a moving Thunderbird automobile and became embedded in the auto's top. The two travelled about 150 feet before coming to a stop. During this time another car and a light truck were involved in a collision with the Thunderbird. Fortunately, there was no fire. The toll – one of the *Cessna* passengers was killed, the pilot and other aircraft passenger were injured, and five passengers in the motor vehicles were injured. The *Cessna* was a strike and the automobiles were heavily damaged.

Investigators found the probable cause of the accident was vortex turbulence from the *Electra* and misjudgment by the *Cessna* pilot of his altitude and clearance during the approach. They also commented that he had worked all night as a line supervisor the night before the flight and assigned pilot fatigue as a contributing factor.

The accident report likened the potential forces of vortex turbulence to miniature, horizontal tornadoes rolling the air in the wake of the *Electra.* These forces are invisible to a pilot following the generating aircraft and cannot be precisely defined. When a small aircraft penetrates the wake of a large aircraft, the resulting turbulence can cause partial or even total loss of control. The insidiousness of this menace is never more apparent than in the takeoff or landing phases when usually there is insufficient altitude to recover.

The only course of preventive action available to pilots is thorough knowledge of the nature of wake turbulence and following optimum avoidance flightpaths in the vicinity of other aircraft. ◄

WHAT'S YOUR POSITION?

A SECTION of vehicles was somewhere on the airport one night, hopelessly lost, and came within a proverbial hair of being wiped out. The section consisted of a radio truck leading a tractor towing an aircraft to the high-power turnup area. Maintenance needed the turn to complete a check.

To set the stage, visualize the runways for all intents and purposes as dual north-south and single east-west. The tower is located in the northwest sector of the field and the vehicles are somewhere on the west side trying to get to the turnup area on the east side.

Escort: Tower, request permission to cross the runway at taxiway Alpha.

Tower: Unable to see you. Say your position again. Are you on the near side or far side of the runway in relation to the tower?

Escort: Far side.

Tower: Where? Say again.

Escort: Far side.

Tower: You're cleared to cross 36R. Hold short of 36L due to landing traffic.

After his clearance the escort, tow tractor, and aircraft started moving east. In actuality the procession was holding short of 36 L on taxiway Bravo. Oh dear!

As the group reached dead center of the duty, an A-7 making a touch-and-go on 36L lifted off and missed them by 10 feet. Ten feet prevented utter disaster for many people, not to mention saving many megabucks worth of aircraft and vehicles.

Investigation revealed the escort driver was completely disoriented and didn't know whereinhell on the field he was. The tower had cleared the group to move without positive confirmation of their position.

The CO recommended that vehicles on the airfield display rotating amber lights so that their presence is always known. He further recommended that tower operators *VERIFY* the position of all vehicles prior to issuing a clearance to cross runways.

Orders written by air stations concerning vehicle movement on the airport are utterly useless unless units take the necessary action to ensure that all line personnel are briefed and familiar with all the procedures to be followed.

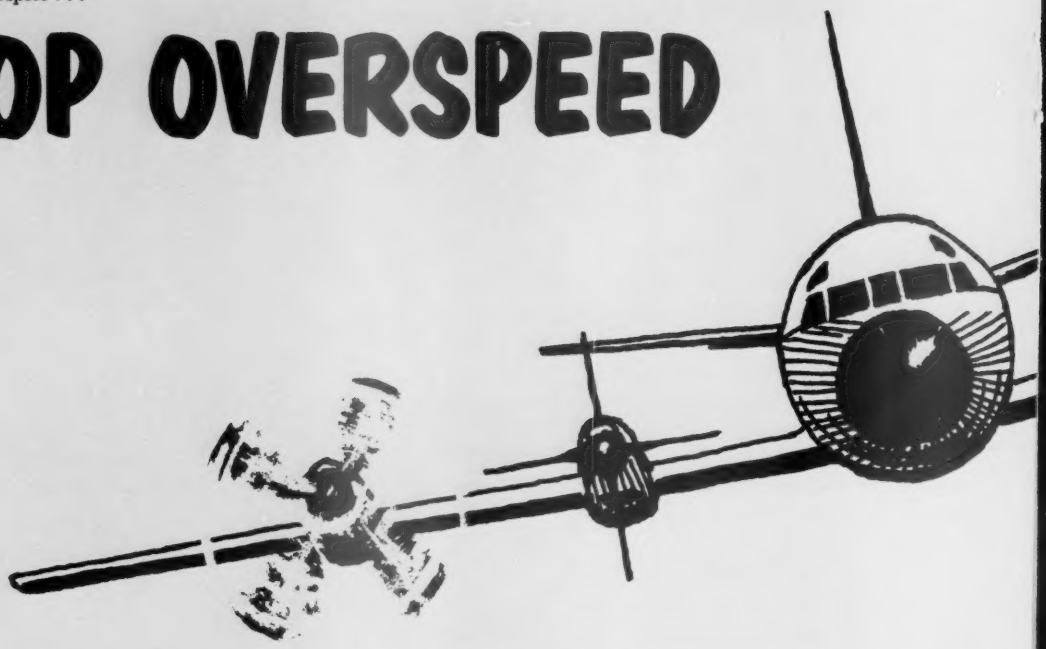
Ignorance of the field layout in this case could certainly have caused tragedy. No pilot likes to even **think** *of some tractor creeping out of the intersection ahead when he's on short final,* **confident** *of a clear deck in that black corridor between runway lights.*

Think about that you line officers. Are all of **your** *people aware of the procedures for crossing runways? Are they familiar with homefield after sundown? – Ed.*

Tell you what we'll do. We'll offer any CO/Ops/ASO of any Naval/Marine air station a big Bravo Zulu if he'll write an article for APPROACH on "how-we-do-it" at your activity. If we're inundated with submissions (two), we'll choose the better one and make it a feature article – including byline and picture. Any takers?

Nearly every naval aviator has been faced with situations while airborne that are not completely covered by NATOPS. In most cases, the ones who know their aircraft best and use good, common sense are successful in coping with the emergency and usually get back OK. Such is the story that follows. The pilot wasn't completely blameless, but he landed safely despite . . .

PROP OVERSPEED



A P-3B crew was conducting NTS checks during climbout at 5500 feet and 175 KIAS. As the power lever was retarded to flight idle on No. 3 engine, things began happening fast – bad things.

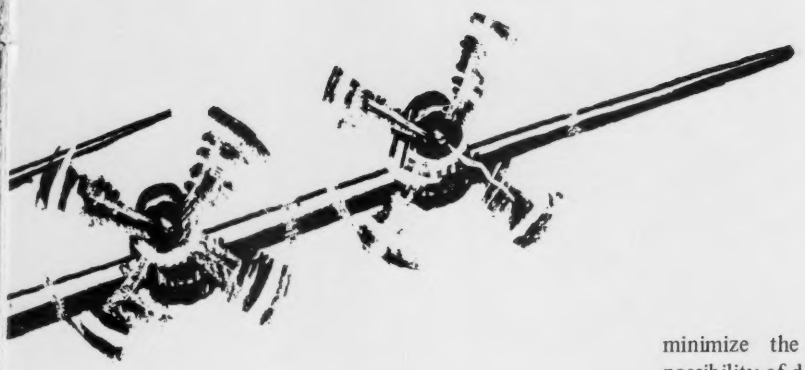
The prop pump No. 1 light came on, and RPM began increasing. The flight engineer secured bleed air from the engine and advanced the power lever. A second or two later, the prop pump No. 2 light on the same engine illuminated, followed quickly by the master electrical light and the No. 3 generator off light. By this time, prop RPM was 120 percent and increasing; the No. 3 sync switch was placed in normal.

There were no signs that any of the actions taken were doing any good. Next, the No. 3 fuel governor/pitchlock test switch was placed in the test position, and the No. 3 power lever was pushed full forward. By now, the RPM had surpassed gage limits and could be heard still winding up. Fuel flow read 500-600 pounds per hour, TIT was 600 degrees, SHP was +500, and the No. 3 fuel and ignition switch were secured to ensure decouple – to prevent excess engine damage.

The last action dropped SHP to zero, but RPM was still audibly rising. The pilot slowed the *Orion*, and after securing the No. 3 oil tank shutoff circuit breaker, he directed the flight engineer to pull the No. 3 engine E-handle. Next, the No. 3 prop feather circuit breaker was pulled. At this time, and with the P-3 slowed to 155 KIAS, no further overspeed could be heard. The pilot directed fuel dump to reduce landing weight. No control problems were encountered, and a three-engine landing was made – with the No. 3 prop windmilling. On landing rollout, RPM indication was regained.

Maintenance sleuths found that the No. 3 engine was decoupled. The engine and prop could be rotated independently, indicating that the safety coupling teeth were sheared. The prop was pitchlocked at a 25-degree blade angle, and there was a massive hydraulic leak coming from around the prop shaft. After the prop had been removed, it was found that the prop shaft O-ring had failed and was torn in several places. The fiber spacer was also split.

The engine had been installed about a month before the incident. It is suspected that the prop shaft O-ring or fiber spacer was defective or even damaged during prop



installation. The aircraft MIM requires the use of a dynamometer in removing the prop assembly from the prop dolly and installing on the engine shaft. The prop MIM doesn't mention using a dynamometer at all. The squadron submitted a UR on the conflict between the two MIMs. The No. 3 engine, prop, and prop control were replaced.

The squadron CO commented as follows:

- The positive 500 SHP indication, prior to the fuel chop, was caused by ratcheting of the decoupler unit. No control corrections for landing were required other than those normally expected with a failed *inboard* engine.
- Little is known by P-3 operators concerning the RPM of a pitchlocked and decoupled prop. The RPM was out of sight on the gage – above 130 percent. The pilots and flight engineer handled the emergency very well – up to the point where they "ran out of NATOPS."
- The PPC's decision to E-handle the engine is seriously questioned. Undoubtedly, the pilot had in mind the experience of another squadron which had an overspeed. (He didn't know the other squadron's overspeed was due to the prop being inadvertently placed into the beta range.)
- The pilot desired to shut down reduction gear driven accessories, operating well above design RPM, to minimize the risk of fire. He reasoned that the possibility of disturbing the pitchlocked condition, if the prop was pitchlocked, was marginal since both prop pump lights were on.
- He had the presence of mind to order the oil tank shutoff circuit breaker pulled before the E-handle to ensure continued oil supply to the rotating reduction gear. It is also noteworthy that the prop pump No. 1 light did not go out when the E-handle was pulled.

The NAVSAFECEN P-3 analyst pointed out that NATOPS is specific about *NOT* pulling the E-handle when either a single prop pump light is accompanied by an overspeed or when both prop pump lights are on.

Some liaison with NARF Alameda and Hamilton Standard was conducted, and best estimates indicate that the prop RPM probably reached about 150-160 percent. If a slug of oil had disturbed the pitchlocked condition when the E-handle was pulled, the prop RPM might have increased to 180-190 percent with a 13-degree blade angle (155 KIAS and 5000 feet).

It's hard to say how long the gearbox would have held together at 190 percent. In addition, severe control problems might have occurred if the overspeed had been on an outboard engine. Two mishaps (maybe more) have occurred in C-130s because of overspeeding props. One mishap ended in disaster, and in the other the aircraft was barely controllable.

Often, pilots feel that they must, in unusual situations, do something, anything. That's bad. The PPC did "run out of NATOPS," but he could have compounded the emergency, especially if the overspeed had been on an outboard engine. Two of the better actions he took were to slow the aircraft and head for the nearest runway. ◄

The Landing Problem

HELICOPTER

WE have recently had occasion to reflect on (and to comment on) the helo landing problem. In fact, during a recent past year, within the 3rd MAW, there were five helicopter landing bashes, versus only two that involved tactical jet airplanes. Two of the helicopter accidents occurred at CAL sites (pinnacle LZs) and three during autorotation (two actual, one practice).

As usual, the pilots wound up holding some or all of the bag, and the investigators ground out the same old recommendations to "rebrief all pilots."

This process has been observed for enough years to know that it hasn't done much good. Helicopters continue to crash short of LZs and at the bottom of autorotations at about the same rate.

The same conclusion has been reached concerning the level of aeronautical knowledge in the helicopter community that was reached some years ago concerning the jet airplane community; namely, that it's lower than it should be.

Before getting down to the nitty numbers, two predictable reactions from rotary wing readers must be disposed of:

(R) "The statement that the level of knowledge in the helicopter community is low implies that helicopter pilots are stupid."

(A) No, sir. What the statement implies is that *helicopter pilots have not been provided with enough knowledge.* If you are given a course in algebra and an exam in calculus, and you fail, who is stupid?

(R) "You can't compare a helicopter to an airplane."

(A) Yes, you can – *if you use the right numbers.*

Now, the numbers that will be used here may not exactly fit your particular model helicopter (or airplane), but they *are* numbers representative of the

VS AIRPLANE

By COL J. M. Verdi, USMCR (Ret.)
and MAJ D. W. Henderson, USMC

current state of the art, as you will see.

First, here's something about aircraft performance, within the following "Rules of the Game":

- Helicopter performance will be compared to airplane performance in the *landing configuration.* (The helicopter is considered to always be in the landing configuration.)
- Performance will be plotted on h-v (height-velocity) diagrams.
- Performance will be quantified generally in terms of Specific Energy and Specific Power.

Both helicopter and airplane pilots are (or should be) familiar with h-v diagrams. Helicopter troops have been exposed to "dead man's curves" for years, and tactical airplane drivers have been exposed to EM (energy maneuverability) curves.

A representative performance envelope for an operational helicopter is shown in Fig. 1. Continued

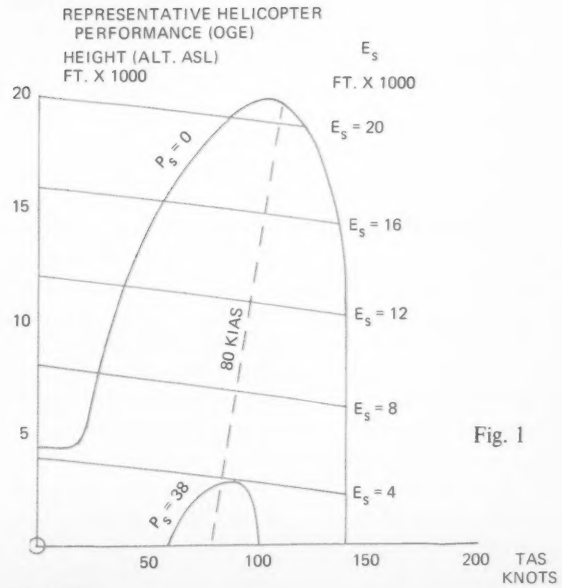


Fig. 1

Here's the frame of reference. First, E_S signifies Specific Energy, total aircraft energy divided by aircraft weight. Written as an equation, it reads:

$$E_s = \frac{\frac{1}{2}mv^2 + mgh}{mg}, \text{ where } m = \frac{W}{g}$$

w = weight (lbs)
g = 32 (ft/sec^2)
v = velocity (ft/sec)
h = height (ft)

and on Earth:

$$E_s = \frac{v^2}{64} + h$$

The units in which E_S is expressed are foot-pounds (energy) per pound (weight), or FEET. The term $v^2/64$ is the specific energy of motion, and the term h is the specific energy of position. The total energy of *any* airplane or helicopter in flight is the sum of the energy of motion and the energy of position. *Everyone* who flies *any* kind of aircraft should lock the significance of this little equation in his brain. And if you can't (or don't want to) remember equations, remember that 100 knots is worth 450 feet, 200 knots is worth 1800 feet, and so on (it goes up as the *square* of the velocity).

Next, P_S signifies Specific Power, the *rate of change* of Specific Energy.

$$P_s = \frac{dE_S}{dt} \qquad \text{where t = time (secs)}$$

The units are foot-pounds per second (power), per pound (weight), or FEET PER SECOND. P_S is really a measure of *excess* power, the difference between the power *required* to sustain a total specific energy and the power *available* from the engine(s). Obviously, the curve labeled $P_S = 0$ defines the maximum sustained performance envelope of the aircraft; within the boundaries of that curve, the aircraft's specific energy can be increased either by accelerating (adding energy of motion) or by climbing (adding energy of position), or both.

As "representative," a helicopter has been chosen which at sea level has 10 percent excess power below 20 KIAS (hover out of ground effect), 50 percent excess power at 60 KIAS, and an optimum power-off glide ratio of 0.25 (L/D = 4.0). It has a maximum speed of 140 KIAS, a cruising ceiling of 20,000 feet at 110 KIAS, and a hovering ceiling of 4000 feet (Fig. 1).

Now, look at a comparable airplane in the landing configuration (gear and flaps down) at landing weight. On the same h-v grid, it looks like this (Fig. 2):

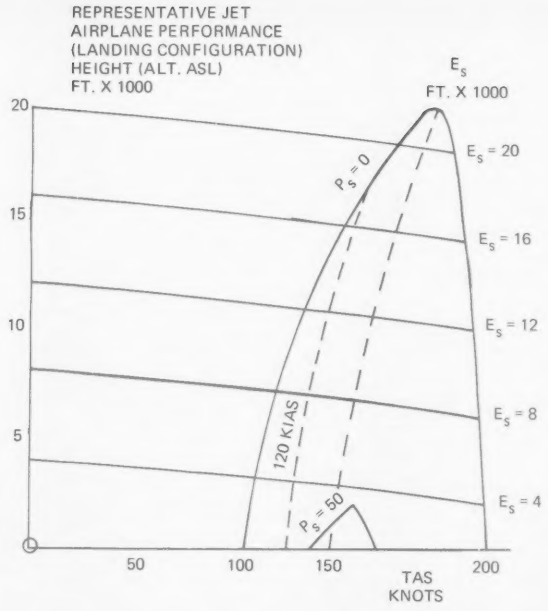


Fig. 2

As "representative," an airplane has been chosen which at sea level has a minimum sustained speed (stall boundary) of 100 knots, 50 percent excess power at 120 KIAS (power approach), and an optimum power-off glide ratio of 0.25 (L/D = 4.0). V_{max} is 210 KTAS, and h_{max} is 20,000 feet at 190 KTAS. Notice that both the representative helicopter and the representative airplane have 50 percent excess power available at their respective *normal* power approach speeds and that they both have an L/D (lift/drag ratio) of 4.0. These are, in fact, representative figures; and they are, in fact, comparable.

So much for the respective maximum performance envelopes. Now, take a closer look at the lower left corner, where most of our operating is done. For the purposes of this discussion, the same sample problem for the airplane (Fig. 3) and the helicopter (Fig. 4) will be posed: Execute a landing, starting from a height of 500 feet and a speed of 120 knots. Label this point "A," and plot it:

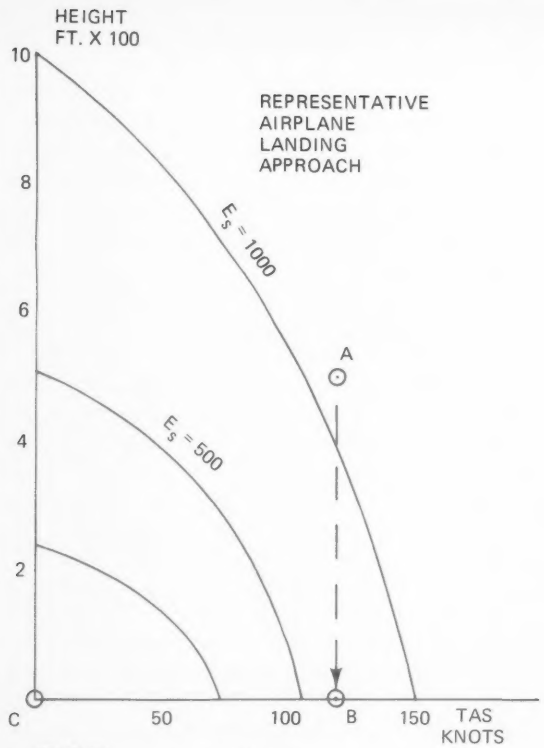


Fig. 3

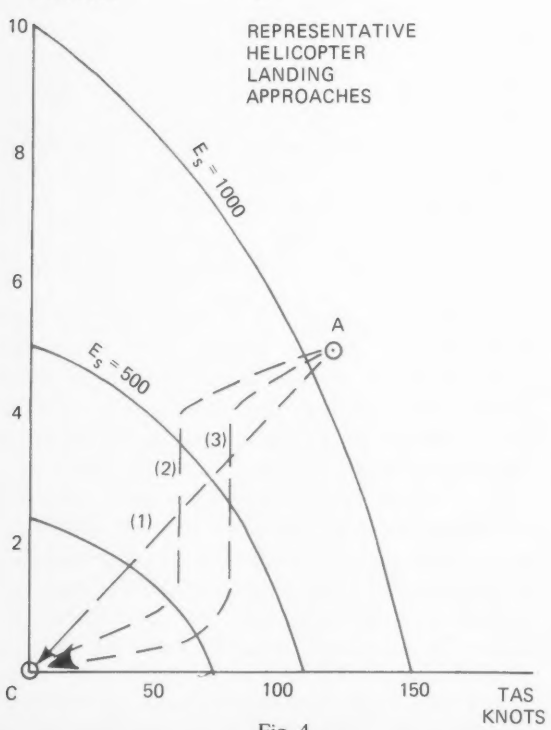


Fig. 4

Also plotted are points "B" and "C." Point "B" is the *airplane touchdown point* – 120 knots on the runway (or deck). Point "C" is the desired end point of the landing process: namely, stopped (undamaged) on the runway (if on a deck, point "C" would move to the right by the amount of headway being made by the ship).

Now, exactly what has the airplane pilot done to get from "A" to "C"? He has entered the game at "A" with 1125 feet of specific energy. From "A" to "B," he has gotten rid of 500 feet of specific energy of position (height above touchdown) and has arrived at "B" with 625 feet of specific energy of motion (touchdown speed). If he has flown on-speed (doughnut), this is the same specific energy of motion he started with at "A" (neglect the difference between IAS and TAS in 500 feet). After touching down at "B," he has gotten rid of this 625 feet of remaining E_S by pumping it into drag chute, brakes, or arresting gear – or some combination thereof. If he flew down a 3-degree glide slope, it took him 50 seconds to get from "A" to "B." If he landed on a runway, it could take anywhere from 20 to 60 seconds to get from "B" to "C" (depending on runway coefficient of friction); on a deck, it could take as little as 3 to 4 seconds from "B" to "C."

Right here, let's take a look at what the airplane pilot has going for him – and it's quite a lot:

- To begin with, he has been able to simplify the problem by dividing it into two distinct procedures: first, get rid of energy of position while leaving energy of motion constant; then get rid of energy of motion without having to worry about energy of position. Right here, he is already one up.

- He has multiple data inputs to tell him exactly where he is (situation inputs) and where he is going (trend inputs). He has a *reliable* indicated airspeed supplemented (depending on type airplane) by true airspeed and/or ground speed (inertial or doppler). He has a *reliable* indicated altitude (barometric) and a radar altimeter. He has a *reliable* indicated vertical speed (barometric). He has an angle-of-attack indicator plus an attitude gyro and an adjustable gun/bomb sight against which he can check both angle-of-attack and flightpath angle *and* (in some airplanes) radar range, V_C, and "pathway in the sky." At a properly equipped airport or carrier, he has electronic glide slope (radar or ILS) *and* optical glide slope (MOLS, FLOLS, or VASI). He may have APC (automatic power control) or even fully automatic approach coupling (ACLS). And that ain't all –

- He has other people to help him stay on the approach or to make the decision to get rid of him if he does *not* stay on approach. There's a GCA (or CCA) operator, an LSO, plus maybe a conscientious air boss,

and sometimes a persnickety old carrier skipper. And these people have their own additional situation and trend information, like the approach lights, the PLAT viewfinder, and the SPN-12.

All in all, the airplane pilot may routinely have as many as 10 installed data inputs plus four more on the ground (or ship), and he may have (besides a copilot, RIO, RSO, or B/N) as many as four more people on the ground (or ship) to help keep him out of trouble.

What about the helicopter pilot? How does *he* get from "A" to "C"? Let's plot some alternatives:

Acknowledging from the outset that there are an infinite number of choices open to the helicopter pilot, three possibilities have been selected:

1. A straight line from "A" to "C": this approximates the maximum energy bleed-off rate (which would be a line from "A" to "C" perpendicular to the reference lines of constant E_S). This is also the easiest one to deal with mathematically.

2. A representative normal power approach, in which the helicopter is slowed first to 60 knots, then brought to a hover.

3. A representative autorotative (power off) approach, in which the helicopter is slowed to 80 knots, then flared to a zero-speed touchdown.

Now, before going into detail on what the helicopter pilot has to do to get from "A" to "C," re-examine the specific energy at "A." Besides the 500 feet of h and the 625 feet of $v^2/64$, which is the same 1125 feet the airplane pilot started with, the helicopter has an additional 205 feet of specific energy of *rotation* tied up in the rotor system (at 100 percent N_r). This hasn't been plotted in Fig. 4 because in a properly executed approach, rotor RPM should remain constant, and consequently, the energy or rotation should not change.

Of course, in the real world, rotor RPM does not always remain constant, and so the energy of rotation does change. This aspect of the problem will be considered later; right now, though, accept it as constant, and now look at what the helicopter pilot has to do to get from "A" to "C." The helicopter pilot must simultaneously get rid of *both* energy of position and energy of motion *concurrently*. This is the basic difference between landing a helicopter and landing an airplane; it is the basic reason why it is more difficult to land a helicopter than it is to land an airplane; and it is the basic reason why it is easier for the helicopter pilot to get into trouble and harder for him to get out of it than for the airplane pilot.

As if all this weren't bad enough, let's inventory what the helicopter pilot has going for *him* – it's precious little.

- Instrumentation is like "Below Average to Unbearable." Below 60 knots (which is where the real trouble lurks), barometric instruments are *not* reliable. Although the helicopter pilot may have a radar altimeter, it isn't any help approaching a pinnacle LZ. He has *no* true airspeed or groundspeed inputs. An angle-of-attack indicator wouldn't help him, and he has *no* suitable analog. He has *no* slant range, closing speed, or glidepath information, unless he is approaching a runway or a ship – but most of his approaches are *not* made to runways or ships. There are no MOLS, FLOLS, VASI, or even POMOLA in most landing zones, and there certainly aren't any such luxuries as APC or ACLS.

- As for people to help him, would you believe a 300-hour copilot? Sure, there may be lots of troops in the zone, but none of them are rated, and the last thing on their minds is helping the helicopter pilot – on the contrary, they're probably counting on *him* to help *them!*

So, what it amounts to is that the helicopter pilot is expected to perform *routinely* a more difficult maneuver with one-tenth of the instrumentation and one-fifth of the supervision.

How much more difficult is the helicopter landing problem?

Three representative final approach flightpath angles have been selected:

- 3 degrees (Normal airport or carrier effective glide slope, also normal power approach for the airplane.)
- 6 degrees (Low precautionary approach for the airplane, "precision" approach for the helicopter.)
- 15 degrees (High precautionary approach for the airplane, autorotative approach for the helicopter.)

For each of these flightpath angles will be calculated and tabulated the time required to fly the approach, the mean rate of specific energy bleed-off required, the waveoff specific power available, and the time and vertical airspace required to reduce the energy bleed-off rate to zero (i.e., to stop the sink rate for the airplane, and to stop *both* the sink rate and the airspeed

TABLE I

COMPARATIVE APPROACH AND WAVEOFF DATA

	AIRPLANE	HELICOPTER	AIRPLANE	HELICOPTER	AIRPLANE	HELICOPTER
Initial Height (A)	500 ft					
Initial Velocity (A)	120 k					
Initial Specific Energy (A)	1125 ft					
Flightpath Angle	-3°	-3°	-6°	-6°	-15°	-15°
Mean Flightpath Velocity	120 k	60 k	120 k	60 k	120 k	80 k
Time to Fly Approach	50 sec (1)	100 sec	25 sec (1)	50 sec	12 sec (1)(2)	16 sec (2)
Touchdown Velocity (B)	120 k		120 k		120 k	
Touchdown Velocity (C)		0		0		0
Specific Energy Remaining (B)	625 ft		625 ft		625 ft	
Specific Energy Remaining (C)	0					
Specific Energy Bleed-Off Rate	-10 ft/sec	-11.3 ft/sec	-20 ft/sec	-22.5 ft/sec	-50 ft/sec	-70 ft/sec
Maximum Specific Power Available	+50 ft/sec	+38 ft/sec	+50 ft/sec	+38 ft/sec	+50 ft/sec	+40 ft/sec
Effective Early Waveoff Specific Power (3)	+30 ft/sec	+23 ft/sec	+30 ft/sec	+23 ft/sec	+30 ft/sec	+24 ft/sec
Time to Stop Energy Bleed-off (3)	2 sec	1.5 sec	4 sec	3 sec	10 sec	12 sec
Height to Stop Energy Bleed-off (3)	10 ft	8 ft	40 ft	33 ft	250 ft	400 ft
Effective *Late* Waveoff Specific Power	Same (3)	+7 ft/sec(4)	Same (3)	+7 ft/sec(4)	Same (3)	+7 ft/sec(4)
Time to Stop Energy Bleed-off	"	3.5 sec	"	7 sec	"	22 sec
Height to Stop Energy Bleed-off	"	20 ft	"	80 ft	"	800 ft

Notes: (1) Airplane approach time from A to B.
(2) Includes Maximum Power Flare.
(3) Based on 1.25G curvilinear flightpath during level-off (n = 1.25).
(4) Based on 1.10G load factor below 20 KIAS (n = 1.10).

decay – or deceleration – of the helicopter. See Table I.).

Now, drive down each one of those three selected flightpaths and pick out the important points of comparison:

• *3-degree Normal Power Approach.* In the airplane, as long as the pilot maintains airspeed and sink rate, he retains waveoff capability down to 10 feet above the deck. In practical terms, this means the LSO can work him into 200 feet short of the ramp and still get rid of him.

In the helicopter, as long as the pilot is maintaining translational lift (i.e., maintains normal approach airspeed 40-80 KIAS) and stays on the glidepath, he is in just as good shape as in the airplane – even a little better, as he only needs 8 feet for a waveoff. BUT, when he loses translational lift (i.e., slows down to 20 knots or less), it's a whole new ballgame. NOW he needs TWICE AS MUCH room as the airplane to execute a waveoff.

• *6-degree Precautionary/Precision Approach.* It's pretty much the same story for both machines at normal approach speed; only now, they need twice as much time and four times as much vertical airspace for a waveoff. Again, if the helicopter slows down to 20 knots or less, it takes him double the time and airspace to get out of trouble.

Right here, go back and re-examine that extra 205 feet of specific energy in the helicopter rotor. Can any of this be thrown into the game? Yes – BUT, as every helicopter pilot knows, NOT MUCH. If he pulls the rotor RPM from 100 percent N_r down to 80 percent N_r (which is about as much as most helicopters will tolerate – and some will run out of directional control if you do this), he can get 36 percent of the rotor specific energy, or 75 feet (this of course neglects friction, which will reduce this figure).

If he has flown a 6-degree approach to a pinnacle LZ but has wound up level with the zone and SHORT, this is what he is going to do: he is going to pull the collective up to his armpit and try to crawl on to that zone by bleeding turns. And you know what? He's going to wind up 5 feet shy (75 minus 80), and he's going to bash the helicopter. Sound familiar? It ought to. It happens umpteen times a year throughout the helicopter world.

• *15-degree Precautionary/Autorotative Approach.* Yes, readers, we know nobody flies an HPLA on the doughnut – we stuck with 120 knots as a reference and to make the mathematics easier (140 knots would be closer to the mark and would jack the waveoff requirement up to 330 feet). Even so, the big news is that the helicopter waveoff requirements now exceed the airplane at *normal* approach speeds.

At this point, most helicopter readers will probably raise the objection that it doesn't take 400 feet to wave off from an autorotative glide. That's quite true – it *doesn't* take 400 feet of *altitude.* What it *does* take is 400 feet of specific energy.

At 80 knots, the helicopter still has 285 feet of specific energy of motion, and this, of course, is what the

pilot uses in a *full* auto. So, 400 minus 285 is 115 feet, which is about where you begin the flare, right? As for that 800 feet in the bottom box, that's what you need for recovery if you chop the power in a high hover – which correlates pretty closely with data from the h-v flight test project at Edwards AFB.

To sum all this up:

- Helicopter performance *is* comparable to airplane performance in the landing configuration *at normal approach speeds.*
- Helicopter specific energy bleed-off rates are *higher* during landing approaches.
- Helicopter waveoffs require *much earlier* decision and *much more* vertical airspace close to touchdown because specific power available is drastically reduced below translational lift speed.

All of which means that it is twice as hard to make a good landing in a helicopter as it is in an airplane; and by the same token, it is twice as easy to make a bad landing (or to bash the machine).

And this brings us to our MESSAGE, which is:

"LET'S GET OFF THE PILOT'S BACK."

Give the helicopter community what it needs to get on top of the landing problem, namely:

- *Flight Simulators.* Properly designed simulators would permit pilots under instruction to see what landing accidents look like without cost or injury. The Army and Navy have made a beginning in UH-1 and SH-3 simulators, but we still have a long way to go.
- *Helicopter Instrumentation.* Proper instrumentation would tell pilots where they are during approaches and give them trend warnings to adjust or wave off *before* landings deteriorate into accidents. Not much of a beginning has been made in this area although we *have* the state of the art.

Finally, let's not accept the dreary excuse that "there's no money." All the simulators and all the instrumentation the helicopter guys need could be bought for the replacement cost of the helicopters wrecked *each year* during landing approaches.

Courtesy 3rd MAW *Safety Review*

NO CUSHION

IT WAS a routine training flight with a dual purpose. First, it was a pilot fam; and additionally, it was a photo flight. The pilots conducted a thorough briefing on emergency and ditching procedures with the crew and two passengers. The latter two were along to provide expertise for the photo part of the flight.

No discrepancies were noted on preflight or turnup of the helicopter. After completing the pretakeoff checks, the HAC lifted into a 15-foot hover and was satisfied all was right with the bird. Just as he began transition to forward flight, a loud bang was heard, followed by a violent shudder and a partial power loss. The helo descended rapidly, hit the ramp hard, and the flight was over.

The mishap board opined that the primary cause of the accident was material failure of the No. 2 engine at a critical time, necessitating an immediate landing. A secondary cause factor was pilot error in that the HAC overreacted to the emergency by easing down the collective instead of using power available to cushion the landing. ◄

CONTRIBUTOR'S CORNER

Safety: A Numbers Game?

By CDR Victor S. Gulliver
CO, VP-49

"Matt, be careful."

WHEN Miss Kitty says to Marshal Dillon, "Matt, be careful," is she truly concerned for Matt's safety and welfare or is she remembering the number of marshals that have been killed in recent years and simply worrying about the marshal loss rate?

There seems to be a growing trend in speaking and writing about aircraft accidents in terms of numbers and rates rather than in terms of people and aircraft lost. Instead of saying that "LT Blob was killed or injured when his aircraft crashed on landing," we hear people say, "the accident rate is now up to 1.5, which is far in excess of the FY-74 rate."

Sure, LT Blob's family and friends are in agony over the occurrence. And a few people who never knew LT Blob are upset about it all; but, for the most part, the majority of the aviation community is unemotional about the whole thing. One of the prime reasons for this lack of concern is the manner in which the event is reported and handled.

Most people relate to other people more than they relate to numbers and statistics. How many newspapers would be sold if the headlines every day read "Murders 31, Burglaries 75, Auto Accidents 131, etc.?" It's not the numbers that create interest in the news articles so much as it is the story that people can relate to. We can read the news article and feel compassion, especially if those involved are ordinary people just like ourselves. We can get very emotional about the events of perfect strangers when their plight is reported in the proper manner. An entire country was up in arms at the report of the Lindberg kidnapping. People, especially families with small children, could relate to the event and feel deep concern for the situation. How would the country have felt if the story had been reported as "Kidnapping is up 2 percent over last fiscal year?"

Aviation safety statistics have an important place as management tools. They are effectively used as factors in determining pilot training rates, aircraft/mission cost effectiveness, and a variety of other aviation related data. But, statistics play a very minor role in stimulating interest in a solid safety campaign. If we are to get people's attention and get them personally involved in a full fledged safety effort, we have to appeal to their personal feelings. We must play on their emotions in the same manner as a newspaper article or a TV broadcast. In our coverage of an accident or incident, we must stress not only what happened, but why it happened and what might have prevented it from happening. This is of particular importance if we expect the publicity to personally involve the entire aviation community.

If we want the VF or VA community to be concerned about a VS or VP accident, we have to show a degree of commonality between these diverse segments of the community. To have personal involvement, there must be personal concern. This concern is stimulated, just as in the Lindberg case, by the feeling that "it could have been me." In our coverage and reporting of an accident, if we can show that a causal factor was improper maintenance or disregard of NATOPS procedures or physiological impairment or lack of appropriate training, etc., we can improve the degree of personal concern because we are touching on matters that affect us all, not just one segment of the community.

Let's not concentrate on the numbers aspect of aviation safety to the exclusion of whys and wherefores. Don't make an appeal for safety based on the need for a rate reduction or for a trend reversal. Stress safe operating procedures and show us where our neglect of these procedures has cost us lives and aircraft.

I know that Miss Kitty is truly concerned for Marshal Dillon's safety because she says "Matt, be careful." She doesn't say "Matt, we've lost three marshals this year, and that's up two from last year!" ◄

"Shucks."

Ramp Mystery

AT 0715, CH-46D No. 93 was observed secured on the ramp where it had been parked and tied down the previous afternoon. Within the next 30 minutes, without anyone noticing, the helicopter had rolled down a sloping gradient about 150 feet and collided with another '46, No. 40. Old 93 came to rest against the port side of 40.

The blades of 93 were folded, but the blades of 40 were spread at the time of impact. Damage was not extensive to either helicopter, but a precautionary blade change was made on each bird.

After the ground accident, the lock of the TD-1A port tiedown chain of 93 was found shattered into three pieces. This caused the hook and chain to separate. The hook remained on the helicopter tiedown ring, while the chain and remaining pieces were found still attached to the ground tiedown padeye.

It was surmised that when the hook parted, the starboard tiedown chain worked loose and failed to hold

THE MOST PROBABLE CAUSE

TWO A-7As launched from a CVA to practice night tanking with a KA-6D, at 14,000 feet. In the same launch was an EA-6A (also scheduled for tanking practice) that climbed to 19,000 feet. In addition, the EA-6A pilot was scheduled for carquals following recovery that night.

While the *Corsairs* were making practice plugs on the tanker, the section leader became aware that the ship was trying to contact the EA-6. The best he could determine, the *Intruder* had lost all navaids and had a weak UHF. The A-7 leader broke off the tanking practice and, after requesting the EA-6 to descend to 14,000, proceeded individually to rendezvous on the ship's 120-degree radial at 44 nm.

The two dissimilar aircraft then proceeded inbound to the ship at 14,000 feet. With the concurrence of the EA-6 detachment OIC, the ship cleared the section for a CV-3 (teardrop) approach to a CCA with a "charlie" on arrival. Weather at the ship was 4000 scattered variable to broken, 7 miles visibility, with several layers of broken clouds above 4000 feet. It was a black night with no visible horizon.

Radar contact was established with the section at 14 nm heading 340 on the 200-degree radial. It was estimated that the section would intercept the final bearing at 8 nm. CATCC, after confirming radar contact, directed the *Intruder* to "dirty" up at 11 miles. (The intention was to separate the two birds, then bring the EA-6 around to final for a straight-in CCA.) A few seconds later, radar contact was lost with the flight.

The plane guard destroyer was subsequently ordered to proceed to the point of lost contact. There, the destroyer located small pieces of wreckage from both aircraft.

The cause of this accident could not be positively determined, but investigators concluded the most probable cause to be a catastrophic midair collision.

It is evident that the EA-6 pilot was placed in an extremely difficult situation which was beyond his ability and experience level. Therefore, assignment of supervisory factors at multiple levels of command was made for the following reasons:

the helicopter. Although set, the parking brake also failed to hold the aircraft. There were no wheel chocks in place.

An experiment was conducted in which No. 93 was towed back to its original parking spot and released. It required the efforts of eight crewmen to start it moving down the slope. A force strong enough to shatter a tiedown lock would have been sufficient to put it in motion. The parking line was adjacent and parallel to the main ramp taxiway, a major route for line vehicles.

The collision was discovered at 0745, and an NC-8 was observed operating along the flight line just prior to the mishap. Because of the force required to shatter the tiedown lock, it is suspected that the NC-8 had run over the tiedown chain. (Note: The ground accident report did not indicate if the NC-8 had been inspected, nor if the operator of the NC-8 had been interviewed.)

The owner and operators of 93 and many more CH-46Ds had arrived the previous afternoon from aboard ship. There may have been some hurry to secure the birds and release the crew on liberty. Chocks were not put into place, and what looked good at the time was accepted, but proved inadequate. In defense of the squadron, the shore station couldn't provide chocks for all aircraft. The squadron now carries not only its own chocks, but also its own tiedowns.

Just a word about the CH-46D parking brakes. The brake system has a design peculiarity in that the ON light illuminates by the pull of the locking handle, not by brake pressure. Thus, the light may show parking brakes ON even though they are not firmly set.

This mishap points out why chocks on parked aircraft should be in place. Everyone in the Navy associated with aircraft handling knows this. If a generalization is allowed, it is this: One will seldom see a fixed-wing aircraft parked ashore without chocks, but *one will seldom see a helicopter with wheels parked ashore with chocks.* WHY? ◄

1. The more prudent option of diverting the aircraft was not used. On pg. 5-19 of the CVA/CVS NATOPS Manual, under Case III, Controlled Descent/Approach paragraph, the following precaution is advised:

"Formation penetrations/approaches by dissimilar aircraft should not be attempted except in *extreme circumstances* where no safer options are available to effect recovery."

2. Failure of CATCC to provide a radar monitored straight-in descent and approach.

3. The penetration was quite different from that specified by air wing doctrine; i.e., a teardrop, clean descent was used whereas a straight-in, "dirty" penetration was called for.

4. The absence of any supervisory recommendation from squadron level when it became evident that a formation penetration was about to evolve.

Because the EA-6 pilot was airborne with a loss of navigational aids, a limited radio capability, absence of night carrier experience, limited recent night formation experience, and deteriorating environmental conditions, the best and safest supervisory recommendation would have been to either bingo both aircraft or to have rendezvoused the EA-6 with the KA-6 tanker and then bingo the section to the designated divert field. ◄

Never before printed, this letter to the editor was received some years ago. It was "found" during housecleaning and is presented (tongue-in-cheek) as a warning to those carrier pilots who, perhaps, feel out of sorts now and then. It is printed as anonymous since it was written in all seriousness.

We Get Letters...

13 October 1965

Honorable Sirs:

If you would allow me, I would like to review a subject that is vital to the Navy's continued rule of the oceans. There is an official report that has been given to the public through the Associated Press that the Navy has lost thousands of aviators because of accidents. What I would like to bring to the Navy's mind is that these accidents were not chance mishaps.

I will try to look at this subject from the Navy's viewpoint. First of all – let us understand that not all aviators are killed through old methods of landing on aircraft carriers or in naval flying, so we must assume; we must take it upon one's self; we must suppose there is a correct way to land on a carrier and fly. What is the trouble? Is the aircraft carrier built right? Are the naval planes circling around the carrier too many times before approaching the carrier for landing? Is the equipment satisfactorily placed on board for catching the aircraft? If so, why are the naval planes tipping over, jockeying to the left, and skidding in a jerky fashion? What is wrong with the eyes of the aviators? Would you allow me to give you an illustration of the unseemly blind condition of the aviator's eyes? Shall we say that looking on the ocean, every day, is dazzling to the eyes? Shall we say that the salt air causes an obscure covering over the eyes almost invisible – to mislead? This misleading condition affects the mind in conjunction with the arrayment of the ocean's scenes below.

Are instructions given to the pilot when he is about to land too sharp? too fast? The fact remains that the pilot is too low, or too high, or too fast. He can't seem to get a straight fix. Does the pilot have time to take tests for his eyes before flying? Could the combination of haze, fog, salt air, cold air, dark gray clouds with no sun cause you to lose your fix on your aircraft carrier? Pilot, you can regain your thinking; you do not have to crash in the ocean or ship. Slow your speed, even off, not too high. Now make a straight run.

I would like to see pilots jog around the top deck for 11 or 12 minutes before climbing aboard. This will clear the mind. I would like pilots to have a few minutes of sunlamp to cut the cold, salt air, wind pressure on face, and would like pilots to take one super-plenamin Rexall multi-vitamin a day. This vitamin will wake you up, clear the mind, and drive out poison in the system; acting like penicillin in its operation in the body. If the pilot has had a bad weekend, two of these vitamins will right him back into position. A small amount of Toranto 100 percent pure olive oil upon arousing in the morning with the vitamin will soften things within and will also mold the nerves in steady going. Corn beef or spinach will give the pilot real active action and fill him with vigor and energy. Sardines will restore energy quickly. Smoked sardines are dead energy, also dangerous. Buy only those packed in olive oil, salt added. Prune juice, taken 12 fluid ounces at a time, will quiet nerves and cause sleep. It is also a safe bowel fruit. Any fried foods will upset the belly juices which in turn upsets the mind.

I would like to see pilots stop drinking any strong liquor or strange foreign drink. Mexican drinks swell the lungs and will disarrange the mind 7 to 14 days later. The delay in the action of the Mexican drink is because the Mexican root in the drink does not come alive for a 7- to 14-day period. One of Hollywood's top male actors died recently because of the Mexican root drink. He did not get sick until he was out at sea for a week. Also remember, the DTs will creep up on any man. The DTs always start within the body and mind. This shaking inside the body is not seen by human life. Also, it can go on for many days inside the body – unknown even to the pilot. Smoking will affect and injure the mind, eyes, ears, lungs. Most of all the eyes. The poison lays underneath the eyes.

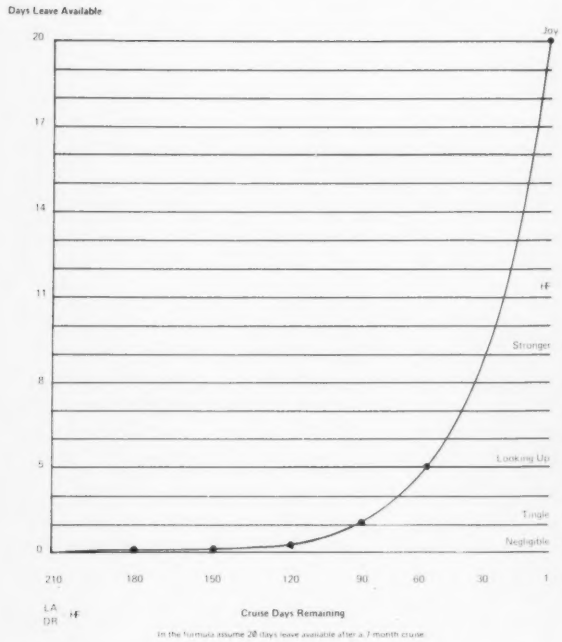
Marriage is honorable and healthful, resting the mind. Devilish women are like old paint on a ship. Hope each man has a copy of the New Testament.

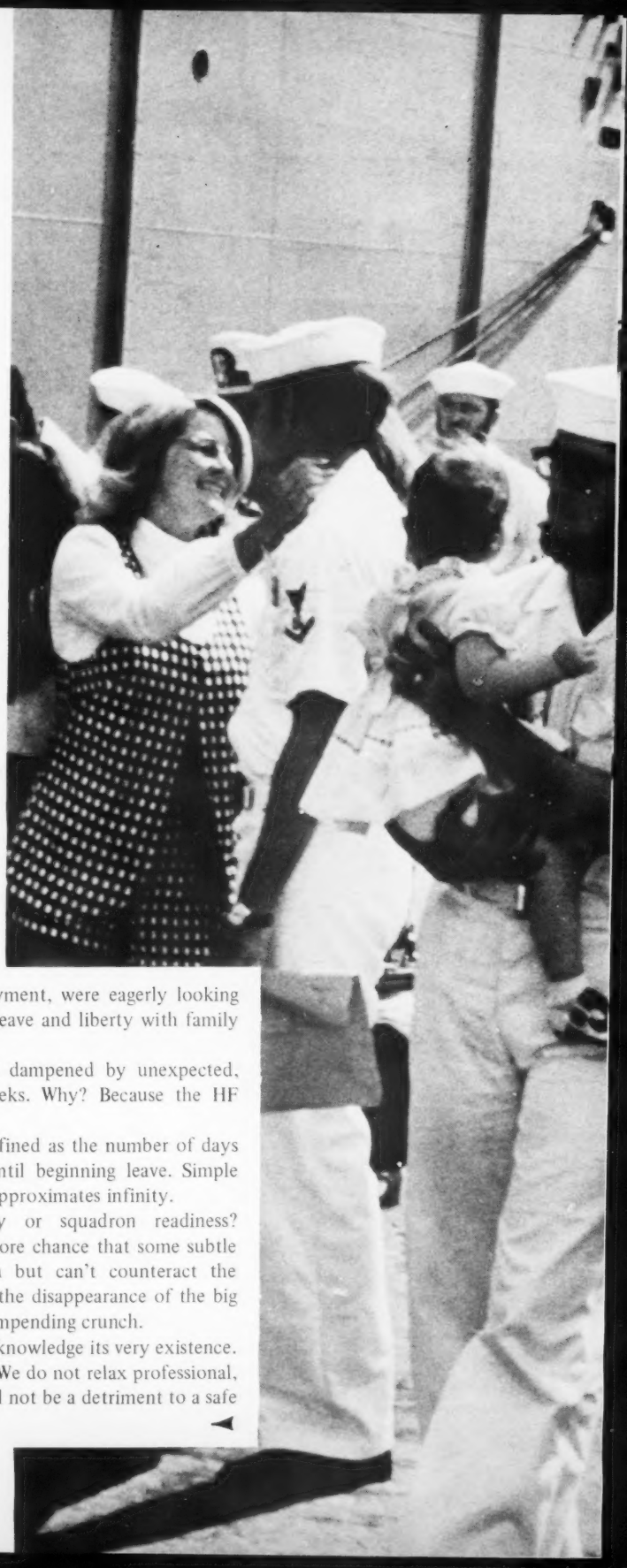
Your friend,

Anonymous

What's Your Happiness Factor?

By LT W. R. Patteson
VP-46





ALL hands, anticipating return from a WestPac deployment, were eagerly looking forward to the postdeployment standdown. Long awaited leave and liberty with family and loved ones would soon be a reality.

A general mood of elation prevailed that wasn't even dampened by unexpected, widespread contingency operations during the last 6 weeks. Why? Because the HF (happiness factor) was up.

During a wardroom bull session I was told that HF is defined as the number of days leave divided by the number of cruise days remaining until beginning leave. Simple arithmetic shows HF will increase until the last day when it approximates infinity.

Does a high HF necessarily enhance flight safety or squadron readiness? Unfortunately – no. Regrettably, the higher the HF, the more chance that some subtle but alarming side effects will creep in. Spirits are high but can't counteract the it-can't-happen-to-me syndrome; the stalking complacency; the disappearance of the big blue book; the slide to semiprofessional performance; or an impending crunch.

So, how do we make HF work in our favor? Easy. We acknowledge its very existence. We hit the book a tad harder. We preflight with more care. We do not relax professional, personal performance. Only then will we know that HF will not be a detriment to a safe return.

Letters

Normally, letters are published and the writers identified. Occasionally, however, subject matter can embarrass the writer, unit, station, etc. In such cases, and when material is deemed to be of sufficient importance, names are withheld – with or without the writer's authorization.

Bingo Story

NALF Nowhere was primary bingo for A-4s bouncing on USS BOAT operating approximately 15 miles at sea. The weather was clear, visibility unrestricted, winds about 10 knots. During the morning, several A-4s had been diverted to NALF for fuel and to await overhead times. At about 1050 local, four A-4s (all singles) arrived overhead NALF, all declaring "low fuel." Since the field did not have an approach control to provide spacing, the situation was somewhat confusing.

The first aircraft to land blew both main tires and took the shortfield arresting gear. Another called "emergency fuel, last pass" and was necessarily cleared to land before the first aircraft could be disengaged from the gear, which was being held off the deck by the tailhook of the first aircraft. The landing aircraft rolled out along the right side of the runway and, luckily, did not engage the cable with a mainmount or nosewheel.

By this time, two other *Skyhawks* from USS BOAT had arrived with low fuel – making a total of four A-4s overhead. As the crash crew released the first bird from the gear, the pilot found he could not taxi with both mainmounts blown, so he "limped" to the port side of the runway and waited for a tow.

Meanwhile, the crash crew was preparing the runway for the remaining aircraft. The arresting gear (E-15 type) normally takes about 17 minutes to reset, so it was derigged and dragged to the side of the runway to reduce the chances of inadvertent engagement. The other aircraft overhead were then cleared to land.

By this time, two of the aircraft had become "emergency fuel," so their entry patterns were highly irregular. The tower controllers provided optimum spacing, and in view of the circumstances, the pilots' performances in taking intervals and controlling their aircraft were commendable. On rollout, each had to clear the aircraft parked on the port side of the runway.

The flap ended within 13 minutes with no damage or injuries, and within hours, all the aircraft departed routinely for overhead times with USS BOAT.

It is believed this close one was the result of the ship trying too hastily to complete a given number of carrier qualifications.

Whatever the cause or causes for this "recovery exercise," when it became necessary for six aircraft to simultaneously bingo to NALF Nowhere with low fuel, the mistake was already made, and a possible disaster prearranged.

The only thing that prevented a disaster from developing was professional performance and luck. We can almost always count on professionalism, but can we always count on luck?

Name Withheld

Take 'em All Off

WE launched from Coastal Air Station in our CH-46 to take eight passengers to USS BOAT. On arrival, we landed and shut down – no problems. We were going to stay for several hours, so the aircraft was secured with many tiedowns.

When ready to depart, our passengers boarded, and we started the checklists. At this time, the LSE informed us they were removing all but four chains. We acknowledged, continued our checklists, then started engines.

When ready to take off, we gave the signal to remove chocks and tiedowns. Four chains and two chocks were removed. They were held up for us to see, and we counted them.

Clearance to go was given by radio and also by the LSE. I increased collective slowly, not wanting to jar the passengers. I had the collective to the point where we were getting light on the wheels when we received a frantic hold signal from the LSE and his supervisor.

I eased the collective back down and saw a deck handler run around to the starboard side and remove another chain from the main landing gear. This definitely made an impression. I don't know who finally saw the fifth chain but he certainly prevented a bad situation.

Name Withheld

Classic Gap

HERE'S a classic in the communications gap. We had recently picked up a bird from another outfit. Upon preflight inspection of the ejection seat, the pin safing the sear could not be budged. Remembering the warning in NATOPS, I immediately suspected that the seat had been fired inadvertently and the pin was all that was keeping it from cooking off. I notified the line troubleshooter who also could not move it and suspected the same. Not about to send it back to the barn in that condition, he dearmed it on the spot, but failed to tell anyone.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, Naval Safety Center, NAS Norfolk, VA 23511. Views expressed are those of the writers and do not imply endorsement by the Naval Safety Center.

As it turned out, the pin had a burr on it and had also been installed backwards. No sweat. As luck would have it, I had the duty that day and was in the barn that evening talking with said troubleshooter, and he explained the problem.

The next day, I was scheduled for the same bird. Reading the yellow sheets, I noticed that the gripe was signed off by an AMEAN who filed the burr off the pin. Knowing that the seat had been dearmed through my conversation the night before, I smelled a rat. I called the maintenance chief (AMEC) and asked if the seat had been QA'd after it had been rearmed. He said that there had merely been a burr on the pin and that he had personally checked the seat because the AME supervisor was taking an advancement exam that morning. I specifically asked him if he was aware that the seat had been dearmed. He wasn't, but was sure that it was back together since he had personally checked it. Always believe your chief, right? *Wrong!*

I went out to preflight the bird. First thing I checked was the seat. You guessed it. It hadn't been touched.

Naturally, I didn't think that was too swift. I called maintenance again and got the AME super out to rearm it. He brought the AN back with him, and the AN did the job under his supervision. Good OJT, I thought.

The job complete, the super QA'd it and gave me a thumbs up. They picked up their marbles and headed back while I resumed the preflight. The first thing I noted was a socket wrench left on top of the ejection seat. The super said he was so involved in QA'ing the job that he didn't see the wrench.

What's the old saying about not seeing the forest for the trees? Embarrassing? It could have been fatal – to me! Check your six.

Name Withheld

In a Bind

NAS Training Command – Upon returning from a training flight in a T-2C, I noticed the ICS was completely dead. Anxious to explain the problem to a troubleshooter, I waited at the aircraft for the maintenance man to arrive. Feeling it would be easier to demonstrate the problem than to explain it, external electrical power was connected.

As the troubleshooter took the front seat, I climbed up the side of the aircraft and leaned over the cockpit rail in the rear seat. Just as I was attaching electrical connections, I began to feel a tremendous pressure on my back. I was being crushed in the jaw of the T-2's clamshell canopy! Somehow, it had been inadvertently actuated.

The troubleshooter, very fortunately, saw immediately what was happening and reversed the direction of canopy travel with the switch in the front seat. I escaped with nothing more than a slight bruise.

It wasn't until later that I realized how fortunate I was. Had the man in the front seat not known immediately the location of the canopy switch, and more importantly, known what to do with it, I doubt I would be here to relate this experience.

In leaning over the canopy rail, some part of my flight gear must have hooked the "guarded" canopy switch to cause the actuation. The lessons here are obvious . . . need I say more? Thanks again to one man who knew what he was doing!

Name Withheld

• Amen!

Lights for Towed Aircraft

NAS Cecil Field – Adequate lighting of towed aircraft has been a problem since the lack of batteries in some jet aircraft left us in a "running dark" situation. This lack of identifiable lighting amid the maze of standard airdrome night lights recently led to a near-miss between one of this squadron's aircraft, which was under tow, and an A-7 making a touch-and-go (refer to WEEKLY SUMMARY No. 46-74, "A Near-Miss – On the Ground").

This event inspired some thoughtful research and we now have a lighting system which is inexpensive, available, and highly effective. A trip to your local GSA store can provide you with safety lanterns (FSN 6230-577-3452 at $3.65 each). Attach one of these to each wingtip by a loop of line. Next, fit a pair of aviator's strobe lights (FSN 6230-067-5209 at $8.65 each) with a loop of line and place one over the nose (probe, nose gear, door, etc.) and another from the tailhook (skag, madboom, etc.). This system gives attention-getting visibility from any angle and greatly increases the probability of detection at night. Total cost – $24.02.

S. A. D. Picciuolo
CO, VA-45

The Way to Go

FPO, San Francisco – CDR Flatley, in his CQ article in the SEP '74 issue, has said it all. All that remains is to convince the powers that be and the hardcore baggers that this is the way to go.

In keeping with the spirit of the article, and to make the touch-and-go pill easier to swallow, why not eliminate the SHIP T&G block on yellow sheets and logbooks? After all, a carrier landing is a carrier landing, and as CDR Flatley points out, "the arrestment, in itself, teaches the pilot nothing."

LCDR Van Stewart
VQ-1

• . . . only that he should have locked his shoulder harness.

" . . . not as I do!"

USS BOAT – "Dammit, boys, do as I say, not as I do!"

I have recently been assigned as squadron flight surgeon with a medium helo squadron whose CO has, for the past 2 years, consistently failed to get his annual physical examination within the prescribed time period. He is currently flying on an expired physical despite repeated attempts by the squadron NATOPS officer, safety officer, and flight surgeon at persuading the "old man" to get the matter taken care of.

If you ask me, this shows gross negligence on the part of a presumably "responsible" man. How can the program of annual physical exams be expected to be taken seriously by more junior officers when the CO of the squadron blatantly refuses to comply? "RHIP," some say. Well, I feel "RHIR" – that's "Rank Has Its Responsibility" – *first*, with the privilege following as a natural result of the responsibility.

If anything, the more senior the officer, the more he needs his annual physical. Consequently, I feel that in this case, the squadron leader is lacking one important characteristic and that is leadership. It's the old "Do as I say, not as I do" attitude which is being displayed here. And that most assuredly leads to a weakening in the squadron's overall effectiveness.

Anymedic

• We agree with your general concept – leadership should, indeed, start at the top. Second thought – why doesn't the flight surgeon issue a grounding chit? ◄

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Phantom Phlyers

How's Your Torque Tube?

By LT R. A. Webb
VF-121 Maintenance Safety Officer

THIS time we were lucky! During a tactics hop, the *Phantom* pilot experienced occasional binding in roll with left stick inputs. The flight was aborted, fuel dumped, and an "uneventful" field landing executed. How uneventful? Well, on rollout, the stick could not be moved to the left . . . on deck, just in time!

Investigation revealed a 5/8″ dzus fastener lodged below the aileron torque tube at the aft bulkhead, restricting torque tube movement to the left (see photo).

The 21¼ inches of exposed aileron torque tube in the front cockpit has long been recognized by the *Phantom* community as being quite susceptible to jamming by foreign objects, and until a FOD shroud for the torque tube is deemed feasible, then designed and funded, it will remain a potential safety hazard. This incident again emphasizes the importance of proper housekeeping as part of good maintenance.

As you sit there pondering the problem, pointing your finger and thinking, "We've got to get those maintenance people squared away," try thinking a moment longer and take that finger and point it at yourself. Keep in mind that you, as aircrew, are the final check prior to flight.

The days of kickin' the tire and lightin' the fire are well past. When was the last time *you* thoroughly checked the cockpit for FOD? Or how about the time you noticed a screw, bolt, or knob missing, or you dropped your pen, flew an uneventful hop, and failed to write a gripe? You probably shouldn't have taken the bird in the first place, but you did complete that all-important sortie – will the next guy complete his?

When reading that FOD gripe signoff, think about this picture . . . do you think they could see that fastener without removing the seat bucket? A few seconds of care on your part may just get you back for happy hour and save the Navy a fine fighting machine *(and pilot and NFO – Ed.)*.

Don't let the "O" in FOD stand for the "other guy" whose fault it always is. Be an aggressive FOD preventer and share that interest with the men that keep you flying.

A HOLE IN ONE...

the hazard of HUNG ORDNANCE